Non-technical summary

Part-time employment as a means to foster total employment attracts considerable attention in the policy debate in Germany. The growth of part-time work was however rather moderate in the last decade. Whereas recent policies aimed to encourage employees to reduce their working hours, very little is actually known about the wage structure and its implications for labor supply. Since the Netherlands is known as the good example as far as the proportion of part-time employment and the decline in unemployment is concerned, I use this economy as a benchmark for the German case.

Provided that there exist significant wage cuts for employees working reduced hours in Germany, this may contribute to explain why the German part-time share falls behind the rise of part-time employment in the Netherlands. I therefore contrast the quality of part-time jobs - in terms of hourly wage rates - with those of full-time jobs. Both economic theory and the institutional framework of the labor markets in Germany and the Netherlands provide various explanations why and how the gross hourly wage rates relate to the number of weekly working hours. However, the shape of the wage-hours profile is not clearly determined by these arguments. Empirical studies for different countries do not provide clear evidence about the wage gap either. Apart from this, most studies focus on a single country and are hardly useful for international comparison, because they use different empirical approaches or samples of different groups of individuals.

Based on a simultaneous wage-hours model, I can show that German part-timers generally earn lower wages than comparable full-time workers. The results further point out that more experienced women, who accumulated more human capital during their working life, face higher wage cuts for reduced working hours then women who spent only few years in employment. The comparison with the wage structure in the Netherlands, which exhibits much smaller wage differentials between full-time and part-time employees, leads one to suppose that the existing wage gap in Germany may impede women, especially the more experiences ones, to take a part-time employment. The central result of this analysis is that the relationship between working hours and wages crucially depends upon individual and job-specific characteristics and cannot be described appropriately by a quadratic polynomial, usually used in the empirical literature.

Comparing the part-time wage gap in Germany and the Netherlands

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Abstract

In this paper, I contrast the quality of part-time jobs - in terms of hourly wage rates - with those of full-timers. Using the Netherlands as a benchmark, helps to assess the size and seriousness of the estimated wage differentials in Germany. Based on two comparable household surveys, I estimate the wage gap between part-time and full-time employees in Germany and the Netherlands, taking into account individual and job-specific characteristics and treating participation and working hours as endogenous. Based on this simultaneous wage-hours model, I can show that German part-timers generally earn lower wages than comparable full-time workers. The results further point out that more experienced women, who accumulated more human capital during their working life, face higher wage cuts for reduced working hours then women who spent only few years in employment. The comparison with the wage structure in the Netherlands, which exhibits much smaller wage differentials between full-time and part-time employees, leads one to suppose that the existing wage gap in Germany may impede women, especially the more experienced ones, in taking a part-time employment.

JEL classification: J22, J24, J31, C31.

1 Introduction[1]

Do part-time workers earn lower hourly wage rates than full-timers? Economic theory provides some reasons to expect the productivity of a part-time worker to be lower than the productivity of a full-time worker, other things being equal. But in real life, these "other things" are not equal. It is well known that in practice part-time workers are on average less skilled, do different types of jobs and presumably employers offer less training to employees with reduced working hours. A look at the median hourly earnings in 1995 indicates that in most countries, part-time workers indeed earn lower wages than full-timers (OECD, 1999). In the Netherlands, median hourly earnings of part-time workers represent about 93 percent of those of full-timers, whereas this ratio is only 87 percent in Germany. There also exists a limited amount of evidence that hourly earnings of part-timers working under 20 hours per week are even lower than those of other part-timers. Partly, these wage gaps can be explained by the various individual and job-specific characteristics mentioned above. But what can be said about these wage gaps if differences in human capital and other wage determining characteristics are taken into account? Previous results suggest that at least in Germany these wage differentials can partly be explained by controlling for individual and job-related characteristics, but there still remains a significant wage cut for part-timers (Kaukewitsch and Rouault, 1998; Bardasi and Gornick, 2000). The object of this paper is to compare the quality - in terms of wage rates - of part-time jobs in Germany and the Netherlands.

Analyzing the existence and the size of wage differentials among jobs with different working hours is an interesting issue in itself, but it also has implications for any employment policy dealing with the idea of work-sharing. Negative wage premiums for part-time jobs, for example, would decrease the willingness of employees to reduce individual working hours. In the last decade, full-time employment growth was negative in Germany and so the positive growth rate of part-time employment was particularly important (OECD, 1999). For some time now, German labor market policy has been promoting part-time work as a means to increase employment. Considering its positive contribution to employment growth, one should keep an eye on the quality of part-time jobs, which

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are often regarded as lousy jobs. Also in the Netherlands, part-time employment growth between 1987 and 1997 contributed substantially to the change in overall employment, though jobs with less than 30 hours contributed comparatively less to the change in total employment than full-time growth rates (OECD, 1999).

In spite of that, the Netherlands is the unchallenged number one with respect to the use of part-time employment among all OECD countries. More than every second working woman works less than 30 hours per week. Also men work reduced hours; in 1995, almost 11 percent of the employed Dutch men worked part-time. According to the OECD (1998), 29 percent of German female employees usually worked less than 30 hours per week in 1995. But substantial differences between East and West Germany still exist. The part-time rate of men is much lower and varies around 3 percent in all German states.

One plausible explanation for the minor role of part-time work in Germany compared to the Netherlands may be the existence of negative wage differentials between full-timers and part-timers and that this financial burden is bigger than in the Netherlands.[2] Theoretically, there exists a variety of explanations why part-time wages may differ from those of full-time workers. However, most empirical labor market studies ignore that wages might be affected by the number of weekly working hours. Recent exceptions include Schwarze (1998) and Wolf (1998) for Germany, Tummers and Woittiez (1991) for the Netherlands, Moffitt (1984), Fraker and Moffitt (1988), Blank (1990), Averett and Hotchkiss (1997), Ferber and Waldfogel (1998), and Mocan and Tekin (2000) for the United States, Main (1988) and Ermisch and Wright (1991) for Great Britain and Ilmakunnas and Pudney (1990) for Finland. Kaukewitsch and Rouault (1998) compare the part-time gap between Germany and France and Bardasi and Gornick (2000) analyze the monetary consequences of part-time employment among women across five industrialized countries - Canada, Germany, Italy, the United Kingdom, and the United States. The empirical evidence on the sign and the size of the part-time gap is mixed. The majority of these studies come to the conclusion that jobs with less than standard hours are rewarded by a lower hourly wage rate. Furthermore, it turns out that in order to fully measure the effect of working hours on wages, the labor supply decision should be taken into account. Even so, there also exists some contradictory evidence. The results differ strongly be-

[2]Apart from the current wage effect, the lower quality of part-time jobs in terms of the returns to part-time experience and the long-term wage effects of part-time spells may impede people from working part-time. This question is addressed by Ferber and Waldfogel (1998) for the US and Beblo and Wolf (2000) for Germany. Based on their results, at least voluntary part-time experience of female employees does not decrease future wages, provided that individual heterogeneity is taken into account.

tween countries, gender and the various econometric methods. Apart from that, most studies focus on a single country and are of limited usefulness for an international comparison, because they use different empirical approaches or samples from different groups of individuals.

A study on the relation between wage rates and working hours accounting for endogenous labor supply does not exist in a Dutch-German comparative perspective. The aim of this analysis is to close this gap. Based on two comparable household surveys, I estimate the wage gap between part-time and full-time employees in Germany and the Netherlands, taking into account individual and job-specific characteristics and treating participation and working hours as endogenous. Using the Netherlands as a benchmark, helps to assess the size and seriousness of the estimated wage differentials in Germany. The empirical part of this analysis is restricted to West-German and Dutch women, because the data sets in use are too small to derive reliable results concerning part-time working men, at least in Germany.

This paper is organized as follows. In the next section, I address the question why the hourly wage rate may depend on hours worked. The econometric model is presented in Section 3. Section 4 describes the German and Dutch data sets used in the empirical analysis and Section 5 presents some descriptive figures of working hours and wages in Germany and the Netherlands. The estimation results are discussed in section 6. The last section summarizes the findings and concludes.

2 Why should wages depend upon hours worked?

In principle, economic theory as well as specific institutional regulations of the welfare system and the labor market in Germany and the Netherlands provide starting points to analyze the relation between working hours and wage rates.

2.1 Brief discussion of some theoretical approaches

The theoretical literature provides several explanations for a dependence of wage rates on hours. Firstly, total labor costs of a firm do not increase proportionally with hours worked, because of fixed labor costs (for example recruiting and training costs, administration and coordination costs, and cost for arranging a work-place). Therefore, Oi (1962) draws the conclusion that lower wage rates are

paid for part-time jobs than for full-time jobs. Additionally, costs of recruiting and training were shown to be a significant impediment to the hiring of part-time employees (Montgomery, 1988).

Considering that fixed labor costs depend positively upon the skill level (see e.g. Hamermesh and Rees, 1988), this approach implies that high-skilled employees should suffer higher wage cuts for part-time work than low-skilled workers. In addition, recruiting and training costs presumably depend upon the organization of work and the importance of firm-specific human capital. For example, occupational groups whose jobs are rather "holistic", meaning that they perform a variety of versatile tasks (e.g. in job rotation schemes) and learn across tasks, have to rely on a great deal of firm specific knowledge which empowers them to do a good job. On the one hand, jobs that permit the exercise of diverse skills are increasingly preferred by employees and are supposed to increase the productivity of certain workers (Lindbeck and Snower, 2000). On the other hand they push up fixed labor costs. This suggests that multitasking jobs are less likely to be part-time and if it happens, the part-time gap may be higher compared to "tayloristic" jobs, which are characterized by specialization by tasks.

Secondly, the number of working hours may directly affect productivity. Given that the hourly wage rate equals marginal productivity of labor, or is at least related to marginal productivity, wages may also react to changes in working hours. Barzel (1973) argues that productivity will first rise slowly due to "start-up" effects at the beginning of a working day. In this setting, the productivity of the last hour of a "normal" working day exceeds the average daily productivity, which leads to lower wage rates for part-time workers. Apart from these start-up costs, marginal productivity may decline for tiredness at higher working hours, which results in a lower marginal wage rate for overtime hours. Barzel showed that the combination of fixed costs of work at few hours and declining productivity at high hours leads to an **S-**shaped budget constraint of the individual, wherein the marginal wage rises initially but eventually falls at high hours of work.

Contrary to these conclusions, Tummers and Woittiez (1991) argue that reduced working hours may raise hourly productivity because they avoid the negative fatigue effect of a long working day or they may reduce unproductive time, or "slack". That is, marginal productivity reaches its maximum at fewer hours than the "normal" working hours. In this setting, gross part-time wages - given that they are based on labor productivity - should be higher. The empirical evidence of Moffitt (1984) supports this hypothesis. The estimation results indicate that wage offers to American older women rise over the part-time range of hours, peaking at about 34 hours per week. The hours effect in the wage equation is

quadratic, leading to an **S-**shaped budget curve.

Kinoshita (1987) presented a different argument for an inverse relationship between hourly earnings and hours of work. If a firm's elasticity of output with respect to additional workers minus the share of total fixed employment costs is greater than its output elasticity with respect to additional working hours, then the firm will offer wages which are declining in the number of hours. Kinoshita (1987) notes that long working hours and simple labor in the age of the Industrial Revolution might be such a case, but he cites no empirical findings to support this hypothesis.

Ermisch and Wright (1991) point out that spatial constraints on the supply of labor may also cause wage differentials. Not only would part-time workers be less willing to pay high commuting costs than full-timers, but they are also less likely to move because in general part-time workers are female and second earners in the household. Because of the restricted mobility of women seeking part-time work relative to those seeking full-time jobs, their labor supply is likely to be less elastic than the supply of full-timers. Provided that employers make use of their monopsony power in the local labor market, profit maximization entails paying lower wages to part-time workers.

Organization theory and the emerging literature on the economics of human resource management policies ascribe more and more benefits to the implementation of part-time employment within a firm. Although the potential effects of flexible part-time work on productivity has not been comprehensively researched, there are several channels whereby alternative time schedules might influence productivity (Shepard et al., 1996). In general it is argued that part-time employment increases the flexibility of the firm to adjust for demand shocks, helps to extend the operating time and thus improves customer satisfaction. Furthermore, empirical studies show that flexible part-time schedules increase the motivation and productivity of employees and reduce absenteeism and labor turnover (see for example Hagemann, 1994; McGuire and Liro, 1986; Shepard et al., 1996; Rose, 1998). Thus, there are good reasons to expect that firms using alternative time schedules are more productive and therefore may pay higher wages, and furthermore that part-time employees may benefit financially from their higher motivation and attendance.

Another explanation for wages to be dependent on hours is based on the idea of compensating wage differentials, which is over 200 years old and goes back to Adam Smith's *"Wealth of Nations"* (1776). This theory is based on the assumption of perfect competition on the labor and product market and derives wage differentials from the heterogeneity of individual preferences and the firm's cost

function. The prediction of this theory is that job characteristics that workers consider undesirable (but save costs of the firm), will raise the pay to compensate for the unpleasant conditions, while those that are desired should be purchased by employees in the form of lower wages. According to this approach, the wage rate can be interpreted as an hedonic price.

It is straightforward to apply this model to part-time working hours. For one thing, preferences on weekly working hours differ tremendously among women by age, education level or household context (see for example, Beckmann and Kempf, 1996). Apart from differences in desired hours, individuals may be subject to binding restrictions concerning the number of working hours. The majority of part-time workers are mothers, who partly do so because they have other home responsibilities. Due to these household constraints, be they desired or not, reduced working hours are a preferred job characteristic and sometimes even a decisive employment condition. For another thing, the provision of part-time jobs may be very cost-intensive for the firm, in particular for highly skilled workers and employees in upper job positions, because this generally requires a reorganization of work within the firm. But also the firms' benefits which pertain with the use of part-time employees differ across job positions, occupations or industries. According to the prediction of the compensating wage approach, we expect the wage cut for part-time jobs to be higher, the stronger the preference for working reduced hours and/or the higher the costs of creating a part-time job within a firm. This hedonic model generates two major insights. Firstly, part-time employees are rewarded a lower wage rate. Secondly, employees with strong preferences for working part-time will tend to take jobs in firms that can offer short working hours at low costs. Workers who are indifferent about the number of working hours will seek out and accept the higher paying, cost-intensive jobs which are not offered to part-time employees. That is, the matching process makes the most of the firms' strengths and the workers' preferences.

In this setting, one would expect that Dutch employees have to accept higher wage cuts for working reduced working hours, everything else being equal, because the share of women who prefer a part-time job and also the actual part-time rate is much higher in the Netherlands compared to Germany (see Wolf, 2000). On the other hand, the trade and private service sector, which generally require a higher share of flexible part-time employees and presumably have different cost functions compared to the industry sector, are much bigger in the Netherlands (see Figure 7 in the Appendix). Owing to the sectoral structure, it seems that part-time jobs can be provided at lower costs in the Netherlands and thus are not supposed to cause higher average wage cuts. Which of these two contrary effects

is dominant can only be decided on empirical grounds. But, the hedonic theory of wages clearly predicts that the wage-gap is smaller in the trade and service sector compared to other economic sectors.

Summing up, the *theoretical* approaches illustrate that one cannot be sure a priori whether average hourly earnings rise or fall with the number of working hours. Previous empirical evidence for Germany, however, clearly supports the arguments explaining negative wage differentials for part-time jobs. In addition, the expounded theories suggest that wage-hours profiles are not expected to be universal, but presumably differ among different groups of employees.

2.2 Institutional framework and part-time wage gap

Regulations aimed at legal equalization between part-time and full-time employees as well as minimum wage regulations are expected to reduce potential negative wage differentials for part-timers. An important feature of Germany and the Netherlands concerning working conditions lies in the early protection of part-time work. However, it is interesting to note that the originators of the equality of part-time workers differ between these two countries. Whereas in Germany, legislation made the first step towards equality in 1985, Dutch unions have a very supportive attitude towards part-time work. Collective agreements already treated part-time workers equally to full-timers long before the position of part-time workers had been arranged legally (den Broeder, 1996).

In the Netherlands, the public and political debate about part-time work, beginning in the middle of the 80s aimed mainly at equal social security coverage of full-time and part-time work. This translated into two very important laws: Since 1993 respectively 1995, full-time and part-time employees have a right to be treated equally concerning minimal wage, holiday entitlement, payment of holidays, overtime payment, extra payment and further education. In Germany, part-time employees are put on equal footing with full-time workers with respect to pay and all other kinds of benefits since 1985 (§2 Abs.1 BeschFG).[3] Also, since 2001 the new law on part-time employment and fixed-term contract, has prohibited discrimination against employees working less than regular working hours (§4 Abs.1 TzBfG[4]).

[3] In this context, equal rights do not mean that part-time employees in principle get the same amount of fringe benefits as their full-time colleagues, but that the basis on which the benefits are assessed must be the same.

[4] *Gesetz über Teilzeitarbeit und befristete Arbeitsverträge.*

As the Dutch example illustrates, unions play a decisive role in defining working conditions for specific groups of individuals. Historically, male dominated unions have mistrusted and disapproved part-time work because it does not meet the requirements of the traditional breadwinner model and undermines employment prospects of males (Hakim, 1997). The traditional trade-union policy has always been to put through a reduction in full-time working hours for everyone. Thus, the creation of part-time jobs or any employment contract other than the one for full-time permanent work is perceived as undermining the objective (Hörning et al., 1995). Because of this attitude, part-time work was long considered a "marginal" employment pattern. In Germany, where unions' power used to be very strong, part-time work and especially marginal jobs were often seen as a threat to standard jobs. As a result, unions tried to prevent the expansion of part-time work for a long time instead of establishing it as regular employment. Just recently, unions' attitude towards the position of part-time employees seems to have changed. Quite the reverse, namely the weakness of Dutch unions, especially at the local level, supported the trend towards flexible working time in the Netherlands and the unions sought to regulate and control these new working arrangements (Soskice et al., 1998).

In addition to this, wage cuts for Dutch part-time employees are restricted by the minimum wage.[5] The ratio of minimum wages to the median full-time rate has declined since the mid 70s and amounts to about 50 percent in the mid 90s. Reduced rates apply to youth workers. Apart from compressing the wage distribution at the lower tail, there exists some evidence that decreasing the minimum wage has significant employment effects (van den Berg and Ridder, 1998 and Soest et al., 1996). Presumably, the minimum wage law has become even more effective since 1993, because people working less than one third of the normal working week were not covered by that law before. In contrast to the Netherlands, a legal minimum wage does not exist in Germany.

Another point concerns the German social security system, which provides a peculiarity that may cause wage cuts for small part-time jobs. Most of the earnings below the threshold for social security contributions, the so-called marginal jobs, are taxed by a lump sum tax at the expense of the employer (15 percent of the gross wage rate in 1995). The empirical findings of Schwarze (1998) lead one to suppose that employers shift the entire tax burden on to the marginal employees, resulting in a wage cut of nearly 15 percent compared to full-time employees.

[5]In the Netherlands, the minimum is a gross wage, which is legally defined on a weekly basis. The full amount is applied to the standard working hours as defined in the collective agreement, part-time employees receive accordingly reduced benefits.

In contrast, social insurance premiums are incorporated into the tax rate of the first income bracket in the Netherlands. Consequently, the percentage of non-labor cost does not depend on working hours, preventing any incentives for the employer.

Also the upper earnings limit of the social security system may affect the distribution of working hours and the part-time wage gap. In both countries, the contributions for the social welfare and unemployment compensation schemes are individually limited by a ceiling. For workers with wages above the ceiling, in general more experienced and higher skilled employees, these contributions appear as a lump-sum tax. In this case, contributions to social security have equivalent effect as fixed labor costs.

Based on the differences in the institutional framework across countries and the theoretical approaches discussed in the previous section, I derive five hypotheses with respect to the sign and the size of the part-time wage gap for specific groups of individuals in Germany and the Netherlands:

H1: The theoretical arguments deriving positive wage premiums for part-time work are rather sparse. In contrast, there are good reasons to suppose that there exist negative wage differentials between full-time and part-time jobs. Weighing the arguments discussed above leads me to expect lower wages for employees working reduced hours.

H2: The importance of the theoretical approaches and the differences in the institutional framework lead one to suppose that wage cuts for part-time jobs, especially for jobs which are not covered by the social security system, are more likely and may be more pronounced in Germany.

H3: Occupations with very high shares of part-time employment, suggesting that fixed labor costs are rather moderate and earnings are generally below the upper earnings limit for social security contributions, are expected to show small or no wage differentials. In contrast, part-time employees in typical full-time occupations are expected to suffer higher wage cuts.

H4: For the same reasons, highly skilled and/or more experienced employees presumably face higher wage differentials than low-skilled and/or less experienced workers.

H5: Firms in the trade or private service industry require a higher amount of flexible part-time employees and furthermore, they may be able to share work among more employees without substantially increasing total labor

costs. As a result, firms operating in these sectors are less likely to enforce lower wages to part-time employees.

Before proceeding with the empirical review of these hypotheses, I discuss alternative methods to model the impact of working hours on hourly earnings and derive the specification of the econometric model I apply in this study.

3 The specification of the econometric model

I estimate the effect of working hours on the wage rate by applying a simultaneous model of wages, working hours and labor market participation.[6] Instead of using a Tobit model of labor supply to capture potential selection effects, I estimate the hours and the participation equation separately to account for differing effects of the explanatory variables on the decision to work at all and on the number of working hours. This allows the computation of any differentials related to hours worked, not just among part-time and full-time work. In order to estimate the relation between working hours and wages, I use both, the traditional quadratic form and an alternative specification which is more flexible. Further, I allow for different effects of working hours for different groups of individuals. Doing this overcomes the drawbacks of simple OLS-wage-equation all at once. I first present a model which makes it possible to estimate different wage-hours profiles for specific groups of individuals, taking into account the complete labor supply decision.

Participation

The selection to enter the labor market is modeled by a binary choice approach. The equation of the continuous latent variable is given by

[6] Given that there exist restrictions concerning the choice of working hours, it may be argued that this assumption is not satisfied and therefore affects the results. In Germany, the share of full-time employees who want to reduce their working hours is higher than the share of part-timers who prefer working longer hours (Holst and Schupp 1994, 1998; Wolf, 2000). Assuming that employees who are not satisfied with their working hours make less effort and therefore earn lower wages than comparable workers meeting their desired working hours, reduces the average full-time wage rate relative to part-time wage rate. As a result, my findings can be interpreted as a lower limit of the actual wage differential between full-time and part-time employees.

$$P^* = Z' \cdot \gamma + v. \tag{1}$$

Given involuntary unemployment, the actual labor market participation must be interpreted as an individual decision under restrictions concerning labor demand. Thus, the vector of exogenous variables (Z) contains both factors which determine the labor supply, such as qualification and the number of small children as well as the labor demand, such as the regional unemployment rate. The participation decision is estimated as a reduced form equation and thus does not include the wage rate. γ presents the parameter vector to be estimated. The assumptions on the properties of the error term v and all other residuals of the model are given below. P^* is unobservable but relates to the observable dichotomous variable P (participation status) as:

$$P = \begin{cases} 0 & \text{if} \quad P^* \leq 0 \\ 1 & \text{if} \quad P^* > 0 \end{cases}$$

Working hours

The second equation describes the hours decision. I use a linear specification with actual weekly working hours as dependent variable,

$$h = Y' \cdot \beta + u \tag{2}$$

where Y is a vector of explanatory variables and β the parameters to be estimated. The error term u adds linearly to the hours function. I specify the reduced form equation of hours worked in a very flexible way, so that it is consistent with almost any structural labor supply model, or is at least a good approximation. The vector Y also includes variables describing the household context, such as the number of small children, the marital status and the other household income. These covariates capture both the opportunity costs of working and to some extent the effect of taxation on labor supply. Of course, the coefficients of this equation cannot be interpreted in a structural way.

Earnings

The discussion in section 2.1 illustrates that economic theory gives little guidance regarding the functional form of the relationship between earnings and hours of

work. Thus, I specify log earnings as a polynomial in log hours commonly seen in the empirical literature on wage-hours profiles. Most of the previous studies suggest that hours affect the wage rates quadratically (Moffitt, 1984; Tummers and Woittiez, 1991). As a first approach, I also use the quadratic specification of the working hours, which arises from the fixed costs of work on the one hand and the declining marginal productivity at high hours on the other hand (Barzel, 1973). I estimate one single earnings equation for all employees, irrespective of whether they work full-time, part-time or any other positive number of hours.

$$\ln w = X' \cdot \overline{\alpha} + \alpha_{k+1} \cdot \ln h + \alpha_{k+2} \cdot \ln h^2 + e \tag{3}$$

The dependent variable is the log gross monthly earnings of employed women. X is the vector of k explanatory variables and $\overline{\alpha}$ the corresponding vector of coefficients. In order to estimate the effect of working hours on wage rates, I include log hours ($\ln h$) and log hours squared $(\ln h)^2$ in the earnings equation - α_{k+1} and α_{k+2} being the corresponding elements of the parameter vector. The unexplained part of earnings is captured by the error term e. Equation 3 contains as a special case the assumption that the worker faces a linear budget constraint, that is a constant hourly wage rate. To see this, start with the identity $\ln w = \ln h + \ln r$, where r is the hourly wage rate. Provided that $\alpha_{k+1} = 1$ and $\alpha_{k+2} = 0$, the result is equivalent to the standard equation of hourly wages: $\ln r = X' \cdot \overline{\alpha} + e$, that is, working hours do not affect the hourly wage rate.

Secondly, I apply a more flexible approach to estimate the wage effect of working hours using a linear spline function (Suits et al., 1978). This piece-wise linear regression does not impose too much structure on the functional form of the relation between hours and wages a priori. But still, this model is subject to the assumption that the impact of working hours on the wage rate is just a shift effect, which is the same for all individuals. In order to allow for different wage-hours profiles for different groups of individuals I use interaction terms of the log hours-splines and a set of explanatory variables. The resulting earning function can be written as:

$$\ln w = X' \cdot \overline{\alpha} + \left(\sum_{j=1}^{n} [\pi_j + \delta_j (\ln h - H_{j-1}) \cdot D_j] \right) \cdot D_x + e, \tag{4}$$

where H_j with $j \in \{1, ..., n\}$ are the frontiers of the different segments of the function, the so called knots and D_j with $j \in \{1, ..., n\}$ are dummy variables whose value is 1 for all observations such that $H_{j-1} \leq \ln h < H_j$, and is 0 otherwise.

However, this earning function will be discontinuous at H_j. Therefore, I constrain the values of the coefficients π_j for $j \geq 2$ so that $\pi_j = \pi_{j-1} + \delta_{j-1}(H_{j-1} - H_{j-2})$. The first knot is set at 15 hours, which is the threshold for marginal jobs in Germany. Other knots are defined at 20 and 25 hours to distinguish among part-time jobs with different amounts of working hours and at 37 hours. The last knot separates full-time employment from overtime hours. Due to differences in the Dutch and German hours distribution, I took 42 hours in the Netherlands and 45 hours in Germany. In order to allow for different wage-hours profiles for specific groups of individuals, I interact this spline function with additional dummy variables (D_x).[7]

The system of the three equations (1) to (3) (respectively (4)) is estimated simultaneously by maximum likelihood. The econometric problem involves both continuous and discrete variables. Therefore, the likelihood function is compounded of two terms, which are probability densities with respect to the limited dependent variable and integrated probability functions with respect to the continuous variables. A detailed description of the likelihood function is given in Appendix A.

Properties of the error terms and identification

The error terms of the three equations (e, u, v) are assumed to be trivariate normally distributed with mean zero and variance Σ. The variance of v ($\text{Var}(v) = \Sigma_{3,3}$) is normalized to one. The three covariances between the error terms are determined by the simultaneous maximum likelihood estimation.

Now, I will briefly address the identification problem. I estimate reduced-form equations of the participation and the hours equation. The earnings function is the only structural equation.[8] Therefore, the crucial question is whether the earnings function can be distinguished from a linear combination of all other functions in the simultaneous model. In principle the model is identified by the functional form. In addition to that, I insert several exclusion restrictions. Firstly, I exclude the individual's taste for work,[9] and all family characteristics, such as the number

[7] Even more flexibility could be achieved by using non-parametric methods or by estimating the knots. However, the limited number of observations for specific groups of individuals retain me from applying these techniques.

[8] This means, that the three equations are resolved such that the hours- and participation decision depends only on explanatory variables which are not determined within this model. However, the earnings equation contains, among others, the number of working hours.

[9] The definition of this variable is given in the note of Table 5 in the Appendix.

of children, from the earnings equation.[10] In order to capture the effect of children on labor supply, I refer to Browning (1992) and use two different specifications in the hours and participation equation. For the participation function, I insert one variable indicating the age of the youngest child and another for the number of children in the household. This specification serves as a rough measure of the time needed for the children. In the hours equation, I use the number of children by age groups, because the age structure is more likely to measure the fiscal burden of the children in the household. Secondly, the marital status, participation status of the partner, and the other household income are excluded from the earnings equation. In contrast to the earning function, I do not use actual years of employment but potential experience in the participation and hours equation in order to avoid endogeneity. Furthermore, the fixed costs of working, measured by a dummy variable indicating whether at least one member of the household is in need of care[11] or whether the observed individual is a single mother with a child younger than 4 years, enter the participation equation. In order to capture the labor demand restrictions, I also include the regional unemployment rate.[12]

4 Data sets, sample selection and definition of the variables

The empirical part of this analysis is based on the German Socio-economic Panel (GSOEP) for the year 1995 and the Dutch OSA-survey of 1994, described in the introduction. Due to the limited number of observations of part-time employees in East Germany and among men both in East and West Germany, I restrict the sample to West German women. For reasons of comparability, I select the observations of women in the Dutch OSA-data.

In this study, I left out immigrants and guest-workers and the Non-European households in both samples, because their labor supply behavior and the wage determination may be substantially different from those of Germans. Since I

[10] These variables do not significantly effect wage rates and therefore are in principle appropriate exclusion restrictions.

[11] Persons who care for their old parents or other relatives face high entrance costs to the labor market, because they would have to pay for a geriatric nurse or an old people's home, which can be extremely expensive according to the state of health.

[12] Being aware that the imposed exclusion restrictions are fairly arbitrary, I did some sensitivity analysis to check whether the results change depending on the specifications. Even if the estimated correlation coefficients vary slightly due to variations of the exclusion restrictions, the effects on the wage equation can be neglected.

am interested in the wage structure of the Dutch and German labor market, I dropped all self-employed women and those working in the farming sector. The selected sample contains women between the ages of 20 and 60 who are not in apprenticeship. In Germany, there remain 2410 observations of West German women, of which 52 percent are working. The Dutch data contain 1734 observations, which provide all necessary information. Dutch women who do not participate in the labor market represent almost 49 percent of this sample. The descriptive statistics of the samples are given in Table 4 in the Appendix.

Data on hourly wage rates are likely to be of best quality when they refer to hourly paid workers and when data are obtained directly from employer records (Rodgers et al., 1993). Since I use household surveys which also include salaried employees, but do not contain information about hourly wage rates, I base my study on data on reported monthly earnings and reported working hours. However, employees may give only a rough estimate of their actual hours of work, hence the measurement error of this variable may be of relevance. This induces the coefficients on working hours (for example, α_{k+1} and α_{k+2} in the earning function (3)) to be downward biased. Rodgers et al. (1993) further report that there is a tendency for workers with earnings below average to overreport and for workers with earnings above average to underreport their earnings. Provided that individuals with low earnings in general also work few hours and vice versa, this response behavior brings about an overestimation of hourly wage rates of part-time jobs and an underrated wage rate of employees working long hours. As a result, estimates of the part-time wage cut are likely to be downward biased.

In Germany, the information about earnings is based on the question: "What was your labor income including the payments for overtime hours last month?" The number of working hours refer to the question: "How many hours per week including the overtime hours do you usually work?" Provided that the employee can use up the excess working hours by taking time off or the employee is not compensated for additional working hours, I use the reported contractual working hours. This applies to about 50 percent of the West German women.

The Dutch data provide exact information on contractual working hours. I adjust the contractual weekly working hours in case people are eligible to take ADV-days, which are additional free days apart from vacation. Actual working hours are defined as the sum of contractual and average paid and unpaid overtime hours. Presumably, this measure overrates the average working hours because part of the reported unpaid overtime hours may be compensated by time off. Unfortunately, the OSA-data do not contain any question about the use of flexible working hours. For reasons of comparability, I do not take into account monetary fringe benefits,

because in the Netherlands firm's social benefits are more likely to be rewarded in terms of non-monetary transfers. Furthermore, differences in the number of days of holiday and absenteeism are not taken into account.

Finally, I will briefly describe the construction of the other variables of my model, based on the two data sets. Since the earnings function is of special interest for my research question, I focus on the explanatory variables in the wage equation:

- EDUCATIONAL LEVEL:
  In Germany, the education level is measured by three dummy variables. Unskilled employees have not completed any vocational training. Skilled women (type I), who represent the reference group, finished an apprenticeship and type II-women further attended a vocational college. (Post-) graduates have a commercial/technical college or university degree. In the Netherlands, I distinguish four education levels. Again, unskilled women have not completed any vocational training. I further distinguish between two levels of vocational training, the lower one being the reference group, and two levels of college degrees, which are the commercial/technical college degree and the university degree.

- LABOR MARKET EXPERIENCE:
  The actual labor market experience is approximated by the number of years in full-time employment. In principle, the retrospective data in the GSOEP would enable me to use two different variables to measure general experience, that is, the years in full-time employment and the years in part-time work. However, the returns to part-time experience turned out to be insignificant in all wage regressions.[13] The Dutch data do not allow a distinction between previous part-time or full-time employment. For reasons of comparability, I use the sum of years spent in part-time or full-time employment to capture the experience-effect in both countries.

- OCCUPATIONAL GROUP:
  The division of occupational groups is based on the International Standard Classification of Occupations (ISCO-88). I created seven categories for both countries, which are managerial employees, professionals, teaching professionals and health/teaching associate professionals as well as educators, clerks, service workers and finally production workers.

[13] One explanation could be that part-time employees participate less in training programs such that their learning by doing is much slower.

- FIRM SIZE:
  The information about the number of employees in the firm does not match across the two data sets. But both data sets allow the definition of four firm size dummies with the following categories. Germany: < 20, 21-200, 201-2000 and > 2000 employees; Netherlands: < 10, 11-20, 21-200 and > 200 employees.

- ECONOMIC SECTOR:
  The information about the economic sector is only partly comparable, because the GSOEP and the OSA-data use different industry classifications. Even so, I identified compatible categories for several manufacturing industries, the construction industry, the trade and service sector, public services as well as banking and insurance. Depending on the available information and the number of observations by sector, I generated nine industry dummies in Germany and seven dummies in the Netherlands.

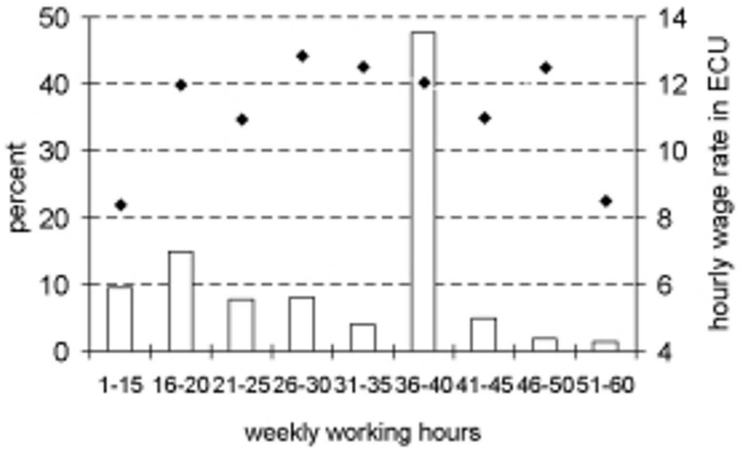
5 Descriptive figures on working hours and wages

Figure 1 provides histograms of weekly working hours and mean hourly wage rates (in ECU) in Germany and the Netherlands. For Germany, I generated nine categories of working hours from 1 to 60 hours per week.[14] Since there are no observations in the upper hours category in the Netherlands, I dropped this category.

The distributions of weekly working hours - described by the bars of the histogram - differ substantially between German and Dutch women. In Germany, there exists a conspicuous peak at 36-40 hours, which mainly represents standard full-time jobs. Women with reduced hours are spread over the range of 5 to 35 hours, but many of them actually work between 16 and 20 hours per week. In view of the fact that agreed working hours never exceed 40 hours per week by collective agreement, about 6 percent of all employed women in the sample work overtime. In contrast, the working hours distribution of Dutch women is more dispersed, exhibiting only a moderate peak in the range of full-time hours. Almost 30 percent of the employed women in the Netherlands work up to 20 hours a week. Also considering that the participation rate of Dutch women is almost five percentage points lower than in Germany indicates that the labor market attachment of Dutch women is weaker compared to German women (OECD,

[14] A few women claimed that they work more that 60 hours a week. In view of the legal limit of 60 working hours a week, weekly working hours are censored at the legal threshold.

Figure 1: Working hours and wage rates in Germany and the Netherlands



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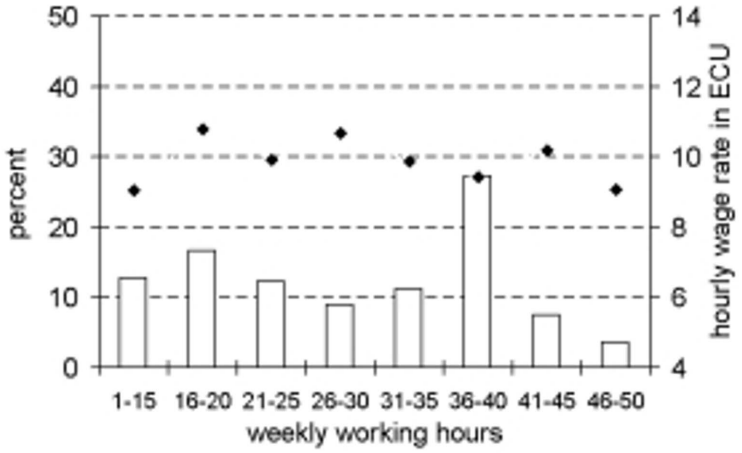

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Note: the bars describe the working hours distribution of female employees and the thombuses denote the mean hourly wage rate for different hours categories.
Source: author's own calculations based on the GSOEP and the OSA-data.

1996). The considerable share of Dutch women working overtime hours may be partly due to the overrating of overtime hours.

The rhombuses illustrate the mean gross hourly wage rates, which are defined as monthly earnings divided by monthly working hours. Again, the variation is greater in Germany. The average hourly wage rates vary between 8.5 ECU for women working 50 or more hours or less than 16 hours and almost 13 ECU

for employees with 26 to 30 hours per week. In principle, overtime hours are compensated with an additional wage premium in Germany. Otherwise, overtime work occurs mainly in salaried jobs. Figure 1 leads one to suggest that either the overtime premiums are avoided or that wages for jobs with "unpaid" overtime work are not as high as expected. Also in the Netherlands, the hourly wage rate at the tails of the hours distribution seems to be lower, albeit the difference is of minor magnitude compared to Germany. But also in the middle range of the hours distribution, the wage rate varies only between 9 and 11 ECU per hour.

These figures suppose that there exist significant wage reductions for German women who either work very short or very long hours, which is in line with the findings of the OECD (1999). However, women working longer part-time hours do not seem to suffer severe wage cuts. In accordance with the results based on median wage rates (see OECD, 1999), figure 1 indicates that wage differentials between full-time and part-time women seem to be smaller in the Netherlands.

Until now, individual heterogeneity among women working different hours was completely ignored. But, previous studies conclude that differences in individual and job-specific characteristics may diminish the raw part-time wage gap. Provided that highly skilled women at the upper part of the earnings distribution work more hours - that is, the substitution effect exceeds the income effect - these wage differentials may vanish to some extend if the education level is controlled for. Another argument is based on the approach of occupational segregation. Women are supposed to anticipate their discontinuous employment pattern (for example, employment breaks or part-time spells) and therefore select occupations which provide flatter wage curves and do not cause severe wage cuts due to employment breaks and part-time work. Furthermore, it has been shown that in most countries female part-time workers are typically concentrated in a few low paid sectors (Beckmann, 1996, Black et al., 1999)

The bottom line of these arguments is that there exist good reasons to expect that the observed wage differences between German part-time and full-time women shrink once human capital and other wage determining characteristics are accommodated in the wage equation. In the following, I check how the raw part-time wage gap changes if both endogenous labor supply and differences in the individual and job-related characteristics of part-time and full-time employees are taken into account.

6 Estimation results of the simultaneous model

I present four models with different restrictions concerning the correlation between the error terms of the three equations and the structure of the earnings equation, to be precise, the relation between working hours and wages. Each model is estimated based on the Dutch and the German data sets. Model 1 uses the most restrictive specification. It is assumed that the relation between working hours and the wage rate is dome-shaped and that participation, hours worked and wages are mutually independent. To put it in technical terms, the correlation among the error terms is restricted to zero. Tests on the coefficients α_1 and α_2 point out whether the standard assumption that hourly wages do not vary with the amount of working hours can be rejected. Model 2 drops the restriction of mutual independence of the error terms. The assumption of dome-shaped wage-hours profiles is loosened in Model 3 by estimating a linear spline function with 5 knots. Until now, all models impose that the impact of working hours on the wage rate is just a shift effect, which is the same for all individuals. But, in order to test some of the hypotheses derived in section 2, I finally check whether the shape of the wage-hours profile depends upon other individual characteristics, such as qualification, experience, occupation or industry sector. Therefore, Model 4 includes several interactions between the spline-function and group-specific dummy variables.

Presenting the estimation results, I pay most attention to the earnings function, because the auxiliary equations of hours and employment status are reduced-form estimates. The models assuming a uniform wage-hours profile for all women (Model 1 to 3) are presented in the following subsection. The estimation results of Model 4, which allows for different wage-hours curves for specific groups of individuals, is discussed in Section 6.2. The estimation results of equations (1) and (2) are given in Table 5 and 6 in Appendix C.

6.1 Models imposing a uniform wage-hours profiles

The earnings function is modeled on the basis of an extended human capital approach. Apart from the standard variables measuring human capital, these are education level and labor market experience, I further include information about the occupation, the firm size and the industry sector.[15] For the definition of the

[15]I do not include tenure as a proxy for firm specific human capital due to severe endogeneity problems. Employees whose abilities match very well with the requirements of their job tend to be more productive, earn higher wages and are less likely to quit their firm than workers

dependent and explanatory variables I refer to Section 4.

The estimated wage functions of Model 1 to 3 are presented in Table 1 for Germany and in Table 2 for the Netherlands. To secure the clarity of these tables, I do not list all coefficients on firm-sizes, industry sectors and occupational groups, but present three Wald-tests on their joint effects. Since I focus on the relation between working hours and wages, I illustrate the wage-hours profiles resulting from the alternative models in Figure 2, 3 and 4. Despite the fact that the dependent variable is monthly earnings, I draw on hourly wage rates in the graphical illustration, because this facilitates assessing the wage differential between part-time and full-time employees.

The earnings function of Model 1 corresponds to a simple OLS regression with log earning as dependent variable and, apart from other explanatory variables, the quadratic polynomial of log hours. Wages increase with the education level and the firm size in both countries (see first column in Table 1 respective Table 2). The coefficients on experience generate the expected dome-shaped curve in the Netherlands, that is, wages rise with labor market experience up to 27 years in employment. In Germany, the quadratic term is much smaller, such that earnings rise steadily with the experience-variable.

Also the wage-hours profiles of German and Dutch women is dome-shaped, that is, the linear term is positive and the coefficient on log hours squared has a negative sign (see Table 1 and 2). In both countries, the coefficients on log hours (α_1) differ significantly from one and the estimated parameters on log hours squared (α_2) differ significantly from zero. Consequently, the elasticity of earnings with respect to hours depends on the number of working hours. To be more precise, the estimated coefficients cause negative wage differentials between part-time and full-time employees, which are in line with hypothesis H1. Despite these basic similarities, Figure 2 illustrates that the shape of the wage curves differs tremendously across the two countries.[16] Furthermore, the results support the hypothesis that the part-time gap is more pronounced in Germany (see hypothesis H2). Based on Model 1, wages of German women raise with the number of weekly working hours until the threshold of 30 hours. On average, the hourly wage rate increases by 0.17 ECU by hour in the range from 5 to 30 hours. Thereafter,

who did not find such a good match yet. Apart from that, it is still an open question whether firm specific human capital creates additional wage growth. Mincer and Jovanovic (1981) and Topel (1991), as two prominent examples, concluded that there are large returns to seniority. In contrast to theses results, recent studies for the US (Altonji and Williams, 1997) and for Germany (Dustmann and Meghir, 2001) do not confirm that tenure generates additional wage growth.

[16]The formula for the expected value of hourly wage rates is described in Appendix B.

Table 1: Estimation results of the wage functions for German women

	Model 1		Model 2		Model 3	
	coeff.	t-value	coeff.	t-value	coeff.	t-value
constant	0.042	0.10	-0.010	-0.03	4.513	32.98
log hours	2.531	9.65	2.808	11.24	-	-
(log hours)^2/100	-2.188	-5.25	-2.841	-5.79	-	-
D1 $(5-15$ hours)	-	-	-	-	0.987	10.73
D2 $(16-20$ hours)	-	-	-	-	1.737	12.05
D3 $(21-25$ hours)	-	-	-	-	0.807	4.49
D4 $(26-37$ hours)	-	-	-	-	0.965	8.90
D5 $(38-45$ hours)	-	-	-	-	-0.196	-0.66
D6 $(46-60$ hours)	-	-	-	-	-0.294	-1.15
unskilled	-0.091	-3.83	-0.040	-1.31	-0.040	-1.42
skilled (type II)	0.008	0.38	0.011	0.47	0.015	0.66
(post-)graduate	0.197	5.77	0.187	5.25	0.223	6.18
experience	0.027	8.58	0.023	5.80	0.022	6.03
experience^2/100	-0.051	-6.16	-0.038	-3.68	-0.037	-3.85
$\rho_{wage,hours}$	-	-	0.221	1.80	0.302	3.11
$\rho_{wage,participation}$	-	-	-0.584	-3.60	-0.574	-4.52
$\rho_{hours,participation}$	-	-	-0.402	-4.38	-0.381	-4.41
Wald-Test statistics:						
hours, hours^2 ($\chi^2_2 = 6.0$)	3197.3		709.5		-	
D1, D2, . . . , D6 ($\chi^2_6 = 12.6$)	-		-		114.0	
firm size ($\chi^2_3 = 7.8$)	95.3		91.2		74.9	
industry sector ($\chi^2_9 = 16.9$)	60.5		62.5		40.9	
occupational group ($\chi^2_6 = 12.6$)	125.4		123.8		128.6	
$\rho_{w,h}, \rho_{w,p}, \rho_{h,p}$ ($\chi^2_3 = 7.8$)	-		19.5		24.3	
mean log-likelihood	-2.506		-2.501		-2.490	
number of observations	2410		2410		2410	

Note: the reference group are skilled women (type I) who work in the chemical or electrical goods industry or in the engineering sector and are employed by a firm with less that 20 employees. The variables D1 to D6 refer to the spline function (see equation 4). The Wald-Test on D1 to D6 refers to the H_0 that all coefficients are equal to one. The other Wald-tests check whether the coefficients significantly differ from zero.
Source: author's own calculations based on the GSOEP 1995.

hourly wages decrease slightly. In contrast, the wage rate of Dutch women does not vary that much with the number of hours worked. The results suggest that the highest wages are paid for jobs with 15 to 25 hours, but the wage cut of working less hours is moderate. The average wage growth up to the maximum at 20 hours is about half of the slope in Germany, that is 0.09 ECU per hour.

It is striking how the results change once the labor supply decision is taken into account (see Model 2). Comparing the estimated covariance matrix among the three error terms reveal one fundamental difference between women in the two countries. The positive correlation between the two residuals in the wage and

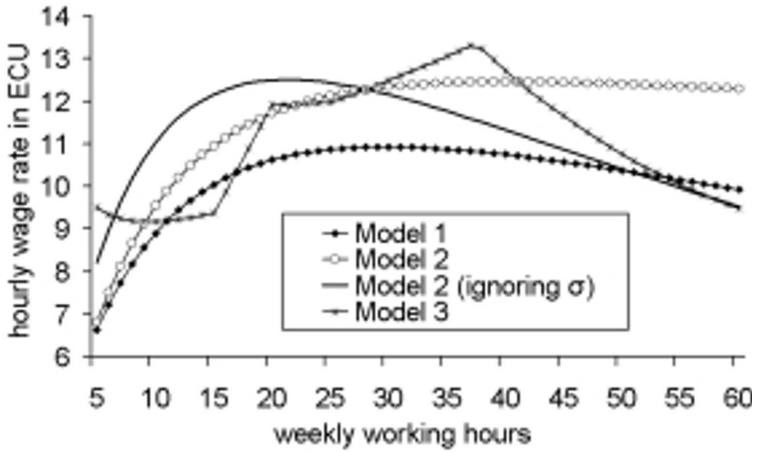
Table 2: Estimation results of the wage functions for Dutch women

	Model 1		Model 2		Model 3	
	coeff.	t-value	coeff.	t-value	coeff.	t-value
constant	0.928	2.09	0.928	2.61	4.114	31.11
log hours	2.007	7.00	1.998	8.03	-	-
(log hours)^2/100	-1.594	-3.46	-1.574	-3.52	-	-
D1 $(5-15$ hours)	-	-	-	-	1.185	13.02
D2 $(16-20$ hours)	-	-	-	-	1.199	6.77
D3 $(21-25$ hours)	-	-	-	-	0.497	2.56
D4 $(26-37$ hours)	-	-	-	-	1.214	9.72
D5 $(38-42$ hours)	-	-	-	-	-0.175	-0.45
D6 $(43-55$ hours)	-	-	-	-	0.638	1.45
unskilled	-0.031	-0.78	-0.037	-0.99	-0.027	-0.73
skilled (type II)	0.089	3.87	0.094	3.83	0.093	3.81
commercial/technical college	0.184	5.81	0.194	5.76	0.196	5.90
university	0.342	7.45	0.351	6.88	0.360	7.10
experience	0.034	10.05	0.033	8.80	0.033	8.85
experience^2/100	-0.062	-6.52	-0.062	-5.93	-0.062	-5.96
$\rho_{wage,hours}$	0.000	-	0.001	0.01	0.075	0.72
$\rho_{wage,participation}$	0.000	-	0.093	0.53	0.055	0.33
$\rho_{hours,participation}$	0.000	-	-0.150	-0.88	-0.156	-0.94
Wald-Test statistics:						
hours, hours^2 ($\chi^2_2 = 6.0$)	1831.3		450.2		-	
D1, D2, . . . , D6 ($\chi^2_6 = 12.6$)	-		-		35.6	
firm size ($\chi^2_3 = 7.8$)	9.4		10.3		10.1	
industry sector ($\chi^2_7 = 14.1$)	9.3		9.1		8.1	
occupational group ($\chi^2_6 = 12.6$)	88.4		63.4		70.7	
$\rho_{w,h}, \rho_{w,p}, \rho_{h,p}$ ($\chi^2_3 = 7.8$)	-		1.3		2.8	
mean log-likelihood	-2.270		-2.269		-2.265	
number of observations	1734		1734		1734	

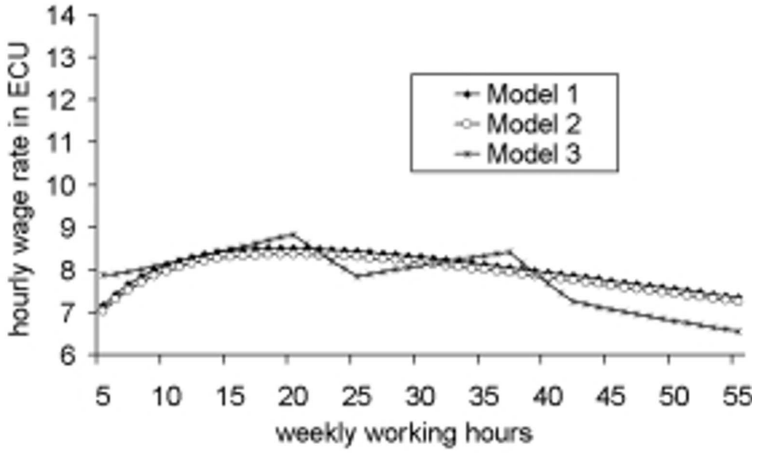
Note: the reference group are skilled women (type I) who work in the electrical goods industry and are employed by a firm with less that 10 employees. The variables D1 to D6 refer to the spline function (see equation 4). The Wald-Test on D1 to D6 refers to the H_0 that all coefficients are equal to one. The other Wald-tests check whether the coefficients significantly differ from zero.
Source: author's own calculations based on the OSA-data 1994.

hours equation in Germany indicates that there may exist some unobserved personal attributes or unobserved job factors which influence the wage rate and the number of working hours in the same way. In the Netherlands, the correlation among the error terms is insignificant. The graphs denoted as Model 2 illustrate the hourly wage rate conditional on the number of working hours and all other exogenous variables in the simultaneous model. This means that wage premiums due to unobserved individual or job-specific characteristics are included. In Germany, the wage curve becomes even steeper. Taking into account the labor supply decision and unobserved heterogeneity with respect to job characteristics

Figure 2: Wage-hours profiles of German and Dutch women



GERMANY



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Note: these wage-hours profiles refer to female clerks (skilled type I) who work in the corresponding reference sector and are employed by a firm with less than 20 (10) employees in Germany (in the Netherlands). The profiles are drawn on the estimation results presented in Tables 1 and 2.

pushes up the expected wage rate, especially for full-time employees. In contrast, we can observe only a slight downward shift of the Dutch wage curve. It is also interesting to contrast this wage profile to the wage rate ignoring the unobserved factors (Model 2 ignoring σ). The wage-hours profile becomes even more bend with a maximum between 20 and 25 hours. This implies that ignoring the wage effects of unobserved personal or job-specific characteristics leads to higher es-

timated wage rates for jobs with reduced working hours and lower wage rates for people working more hours in Germany. However, it should be noted that in this model the correlation coefficient $\rho_{w,h}$ is only significant on the 10%-level. The negative correlations concerning the error term of the participation equation $(\rho_{w,p}, \rho_{h,p})$ are surprising. Perhaps institutional constraints are at work here that have not been captured by the model.

The results for the Netherlands are quite different, because all three correlation coefficients are very small and insignificant. In other words, unobserved heterogeneity among Dutch women affecting both, working hours and wage rates could be neglected and an illustration of the wage-hours profile ignoring σ is obsolete. This implies furthermore that an OLS wage regression of Model 2 would generate satisfying results in the Netherlands, but produce biased estimates of female wage rates in Germany. Accordingly, comparing the likelihood values of Model 1 and Model 2 reveals that allowing for correlation between the error terms of the three equations improves the fit significantly only for Germany.[17]

Loosening the restriction on how working hours relate to hourly wage rates by estimating a linear spline function indicates that the wage-hours profile does not seem to be a smooth curve, but has some kinks (see Model 3 in Figure 2). Based on the *Akaike Information Criterion* (AIC) and the *Schwarz Criterion* using Bayesian arguments (BIC), I can conclude that the fit of the model improves compared to Model 2 in both countries.[18] Since the dependent variable is log earnings and the spline function is defined in log hours, the coefficients of the spline function (D1, ... D6) can be interpreted as elasticities. $\delta_1 < 1$ indicates that the hourly wage rate decreases in hours worked in the range from 5 to 15 hours per week, $\delta_1 = 1$ denotes constant earnings and $\delta_1 > 1$ yields an increasing wage-hours profile in the first hours category.

Apart from the local peaks at 20 and 37 hours and the downward shift at the right tail of the hours distribution, this more flexible wage-hours profile coincides fairly well with the profile of Model 2 in the Netherlands. In Germany, however, the piece-wise linear wage-hours curve differs substantially from the previous model. Wage cuts of jobs with long working hours seem to be much higher than initially

[17]The LR-test statistic of the Likelihood ratio-test is 23.5 in Germany and 1.4 in the Netherlands. The critical value of χ^2_3 is 7.8. Furthermore, the Wald-test of the three correlation coefficients is significant as well (see Table 1 and Table 2).

[18]Model 2 and Model 3 are non-nested, hence the LR-test is not the appropriate test for the model selection. The AIC is the maximum likelihood value penalized by a quantity equal to the number of parameters. However, the Akaike's procedure is inconsistent if the "smaller" hypothesis is true (Gourieroux and Montfort, 1995). Therefore, I also calculate the Schwarz criterion, which is consistent.

suggested by the previous models. Furthermore, the correlation among the equations of the simultaneous model increase in absolute terms and the correlation between the error terms in the wage and hours equation becomes significant at the 5%-level. This indicates that allowing for a more flexible wage-hours profile captures part of the unobserved heterogeneity affecting wage rates and working hours of German women in opposite ways. This finding becomes intuitive by considering the hourly wage rates for weekly working hours beyond the standard working time. Model 3 denotes that employees have to accept significant and increasing wage cuts, the more overtime hours they work - for whatever individual or job-related reasons. The inverse relationship between hours and wages is not captured by the wage-hours profile of Model 2 and therefore enters the correlation coefficient $\rho_{w,h}$.

6.2 Models allowing for group-specific wage-hours profiles

Until now, it has been assumed that the impact of working hours on the wage rate is the same for all individuals. Even if the way in which working hours influence the hourly wage rate should be independent of individual or firm-specific characteristics, the intensity of the various effects discussed in Section 2 could vary across different groups of employees. Therefore, it may be argued, that the shape of the wage-hours profiles in Germany and the Netherlands are triggered by neglecting considerable heterogeneity with respect to the relation between working hours and wages.

In oder to estimate a set of different wage-hours profiles, I include several interactions between the spline-function and selected individual and firm-specific characteristics (Model 4). Since in Germany the occupation specific wage-hours profiles seem to be biased by teachers I alternatively estimate Model 4 excluding these observations from the sample. Table 3 shows the estimation results of Model 4 based on the German and Dutch data. In order to guarantee clarity, the table only provides joint Wald-tests to check whether a specific spline function differs significantly form the reference group. Again, I use figures to illustrate the different wage-hours profiles (see Figures 3 and 4).

Two primary observations should be made about these results. Firstly, the assumption that the impact of working hours on wages is the same for all individuals must be strongly rejected.[19] In Germany, I can identify different hours

[19]The LR-test between Model 3 and Model 4 in Germany generates a test statistic of 98.4 with 30 d.o.f and the 5 % critical value is $\chi^2_{30} = 43.8$. In the Netherlands, the value of the LR-test is 34.4 with 18 d.o.f., the 5 % critical value being $\chi^2_{18} = 28.9$.

Table 3: Estimation results of the wage functions of Model 4

	Germany				Netherlands	
	all		excl. teacher		all	
	coeff.	t-value	coeff.	t-value	coeff.	t-value
constant	4.247	24.52	4.256	34.14	4.125	23.15
D1	1.165	5.33	1.166	7.40	1.445	9.31
D2	1.876	3.49	1.895	4.76	0.313	0.78
D3	0.251	0.43	0.400	0.75	0.762	1.35
D4	1.381	5.15	1.248	5.28	0.964	2.96
D5	-0.793	-1.18	-0.821	-1.70	-1.402	-1.44
D6	0.808	0.89	0.843	1.26	1.760	1.13
unskilled	-0.052	-1.94	-0.058	-3.08	0.022	0.55
skilled (type II)	0.017	0.77	0.023	1.50	0.102	2.18
commercial/technical college	-	-	-	-	0.204	3.76
university	0.214	6.26	0.211	8.16	0.372	6.05
experience	0.018	2.93	0.018	4.18	0.032	4.27
experience^2/100	-0.030	-2.28	-0.030	-3.24	-0.059	-3.56
$\rho_{wage,hours}$	0.145	1.35	0.162	2.18	0.088	0.77
$\rho_{wage,participation}$	-0.430	-2.88	-0.407	-3.84	0.023	0.10
$\rho_{hours,participation}$	-0.350	-3.75	-0.362	-5.45	-0.150	-0.44
Likelihood ratio test	$\chi^2_{30} = 98.4$		-		$\chi^2_{18} = 34.4$	
Wald-Test statistics:						
D_j (ref. group)	23.2		43.8		22.8	
$D_j \cdot$ (5-10 years exp)	12.8		23.8		14.4	
$D_j \cdot$ (>10 years exp)	12.3		25.6		23.1	
$D_j \cdot$ (OCC2)	34.9		32.0		-	
$D_j \cdot$ (OCC3)	19.4		37.7		-	
$D_j \cdot$ (service/trade)	25.5		22.5		11.6	
firm size	68.8		134.3		10.1	
industry sector	34.0		32.1		10.5	
occupational group	36.8		78.8		76.3	
$\rho_{w,h}, \rho_{w,p}, \rho_{h,p}$ ($\chi^2_3 = 7.8$)	16.8		32.3		1.8	
mean log-likelihood	-2.469		-4.779		-2.255	
number of observations	2410		2366		1734	

Note: see Table 1 and 2 for the critical values of the Wald-test statistics and the definition of the reference group. The Likelihood ratio test compares Model 4 to Model 3.

effects depending on the number of years in employment, the occupational group and whether the individual works in the sales and service sector or not. In the Netherlands, however, the shape of the wage profile depends only upon the experience variable and the industry sector. Contrary to the hypothesis derived in Section 2, the education level turned out to be irrelevant for the shape of the wage-hours profile in both countries. Secondly, taking into account that the wage-hours profiles differ across groups of individuals reduces the correlation among

the equations of the simultaneous model in absolute terms and $\rho_{w,h}$ becomes insignificant again. This means that Model 4 captures more unobserved personal or job-related factors which affect wages and working hours of German women in the same way. In the Netherlands, the correlation is still insignificant, implying that a simple OLS regression would be fine in this specific case.

Experience dependent wage-hours profiles

Figure 3 illustrates the wage-hours profiles of German and Dutch women depending on the experience level. German women who have the characteristics of the reference group (see note of Figure 3) and work up to 15 hours earn more or less constant wage rates, irrespective of the number of working hours and their previous labor market experience. This may indicate that these women mostly do temporary work which does not require any specific experience. Once these women have more extensive jobs, experience influences the slope of the wage-hours profile. The more years a woman has already spent in employment, the stronger the wage growth for longer working weeks. To put it differently, the returns to experience are higher in jobs with more working hours. But, previous labor market experience seems not to be rewarded in jobs with 15 or less hours. Loosening the restriction of one universal relation between working hours and wages further shows that the downward slope of the wage curve for small part-time jobs in Germany (see Figure 2) can be attributed to specific groups of individuals and does not apply to all employees.[20]

Figure 3 reveals another striking feature, that is, the German wage distribution is bimodal with two peaks at 20 and standard full-time hours. The fact that the distribution of working hours resembles the wage-hours profiles could be interpreted as a result of compensating wage differentials. Accordingly, employees are supposed to accept wage cuts if they are able to deviate from these "standard"-working hours. However, this argument is based on the assumption that these jobs are indeed much sought after by female employees. Comparing the distribution of actual and desired working hours available in the GSOEP supports this hypothesis. Figure 6 in the Appendix illustrates that the demand for jobs with 20 to 36 hours per week exceeds the currently available jobs among German women. An alternative interpretation of these peaks refers to the common survey-method problem, that respondents simply concentrate at focal points of the hours distribution. In this case, the peaks do not reflect anything real.

[20] I will deal with this result in more detail when presenting the occupation and sector specific wage-hours profiles.

Figure 3: Experience dependent wage-hours profiles of German and Dutch women

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Note: these figures are drawn on the estimation results of Model 4. All profiles are calculated for female clerks (skilled type I) who work in the corresponding reference sector and are employed by a firm with less that 20 (10) employees in Germany (the Netherlands). Women working in bigger firms or other sectors but not in trade or services face the same wage-hours profiles, albeit they may be shifted upwards or downwards.

The wage cut for over-time work, which is especially pronounced for women who already worked between 5 and 10 years, is rather disturbing and cannot be explained by the approach of compensating wage differentials. There exists almost no supply for working more than 40 hours and almost 90 percent of those who actually work more than 40 hours prefer working less hours, that is up to 40

hours (see Wolf, 2000).

Also in the Netherlands, previous years in employment significantly change the slope of the wage-hours profile, but the effect is moderate compared to Germany. Furthermore, it cannot be argued that the return to experience increases with the number of years spent in employment, because the spline functions of women with 5 to 10 years in employment and those working more than 10 years are almost parallel. However, it should be noted that very experienced women suffer less wage reductions if they work more than standard full-time hours compared to women with 10 or less years in employment. Rather striking is the wage curve for women at the beginning of their working life (see Figure 3). These results would suggest that Dutch women with less than 5 years of experience receive a positive wage premium for part-time work (up to 25 hours), irrespective of the occupational group and the industry sector their firm belongs to. Given that this premium only applies to part-time women, cohort effects are not likely to explain this wage differential.

Occupation and industry depending wage-hours profiles

The remainder of this section refers to the wage-hours profiles of different occupational groups and industry sectors. Due to the limited number of observations, I further aggregate some occupational groups. In Section 2.1, it was argued that fixed costs for recruiting and training impede the hiring of part-time employees on the one hand and may cause wage cuts for employees with reduced working hours on the other hand. Accordingly, I grouped the occupations depending on their part-time shares (see Table 7 in the Appendix), supposing that they follow similar wage-hours curves.[21] Managerial employees, technicians and associate professionals as well as production workers represent the group with the lowest probability to work part-time in both countries and are therefore put together to one group (OCC1).[22] Due to the limited number of professionals, especially in the Dutch data, professionals are added to teaching/health professionals, whose part-time rate is far above average (OCC2). After these transformations, there remain four occupational groups (OCC1, OCC2, clerks, service workers), for which I can

[21] Other grouping principles are conceivable. I also tried alternative compositions of occupational groups, but the following specification yields the best model fit.

[22] These typical full-time occupations cause particularly high fixed labor costs for part-time employees, because the arrangement of a part-time job may require an extensive reorganization of work within the establishment and employees with these specific occupations therefore presumably suffer substantial wage cuts for less working hours.

estimate separate occupation-specific wage-hours profiles. Apart from that, I include an interaction between the spline function and the trade and private service sector. The occupation-specific spline function of OOC1 does not differ significantly from the reference occupation (clerks) in both countries and is therefore excluded from the set of explanatory variables.

The estimation results are presented in Table 3 and the corresponding wage-hours curves are illustrated in Figure 4. It is interesting to note the opposed shapes of the wage-hours profiles of women working in the trade or service sector in Germany and the Netherlands. Whereas Dutch employees in these sectors earn higher wages if they work less than 25 hours per week, the wage rate of their German colleagues seems to shrink up 15 hours per week and remains rather constant in the range from 20 to 37 hours. This finding may suggest that the Dutch trade and service sector have a substantial demand for flexible part-time employees, such that they cannot afford to pay lower or even equal wages to part-timers.[23] Another explanation refers to the lump sum tax at the expense of the employer for German employees not covered by social security (Schwarze, 1998). Since these marginal employees are mainly employed in the trade and private service sector, the wage gap for small part-time jobs should be bigger in these sectors, if firms shift the tax burden on to the employees.[24] Despite these differences, there is no evidence for severe negative wage differentials between part-timers and full-timers in the Dutch or German trade or private service sector, which is in line with my hypothesis H5.

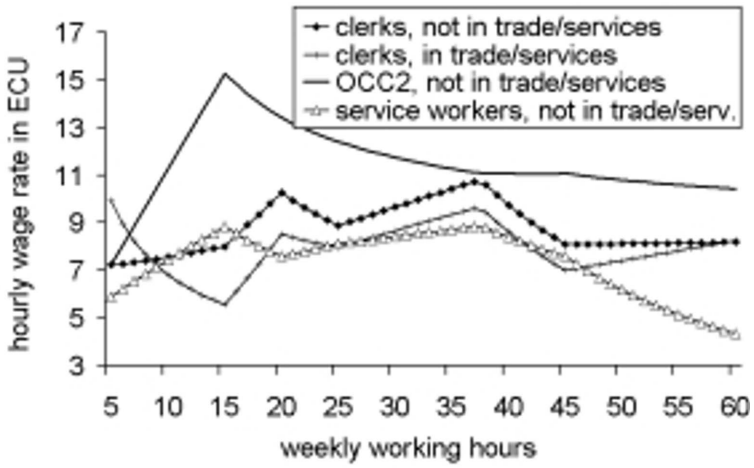
Apart from the occupational group OCC2, also the two other occupation-specific wage profiles of German women are fairly flat in the range from 20 to 37 weekly working hours. They differ in that the wage rate of service workers rises up to 15 hours and suffer a continuous wage decline for jobs above standard working hours, whereas the wage curve of clerks exhibit two peaks at 20 and 37 hours and show a moderate wage cut for overtime hours.

The most striking result concerns the wage profile of professionals, associate professionals and educators, which has a very unusual shape. Hourly wages are shooting up in the range between 5 and 15 hours and smoothly fall thereafter. This result would suggest that there exist substantial wage premiums for part-time employees in these particular occupations. However, a closer look into the

[23]The share of women who work in the trade or private service sector is much bigger in the Netherlands. Furthermore, the part-time share in these sectors clearly exceeds the German level (see Figure 7 in the Appendix).

[24]According to calculations based on the German census in 1995, the share of marginal employees is almost 14 percent in these sectors. Firms belonging to other sectors employ only 8 percent of their staff as marginal employees.

Figure 4: Wage-hours profiles of German and Dutch women depending on occupational group and industry sector



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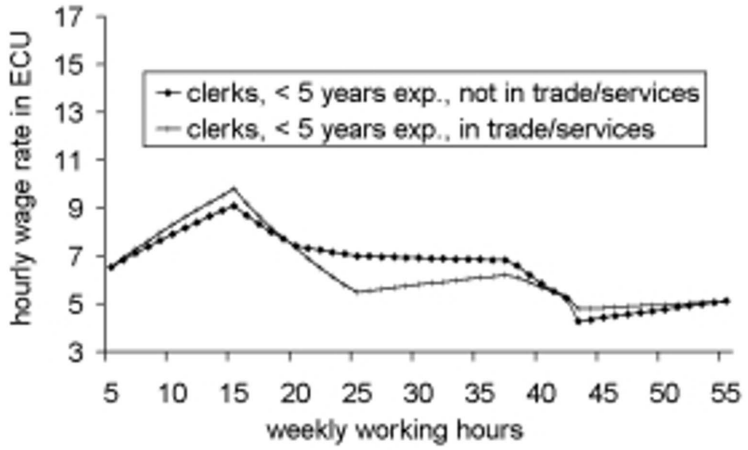

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Note: The picture is drawn on the estimation results including all significant interactions with the spline function (see Table 3). All profiles are calculated for skilled employees (type I) who have less than 5 years of experience and work in a firm with less that 20 (10) employees in Germany (the Netherlands).

data reveals that this peak is mainly driven by teachers, whose working hours may contain high measurement errors. In general, a lectureship of a schoolteacher involves not more than 24 lessons, which corresponds to about 18 hours per week. If these respondents only report their time spent for lectures ignoring any

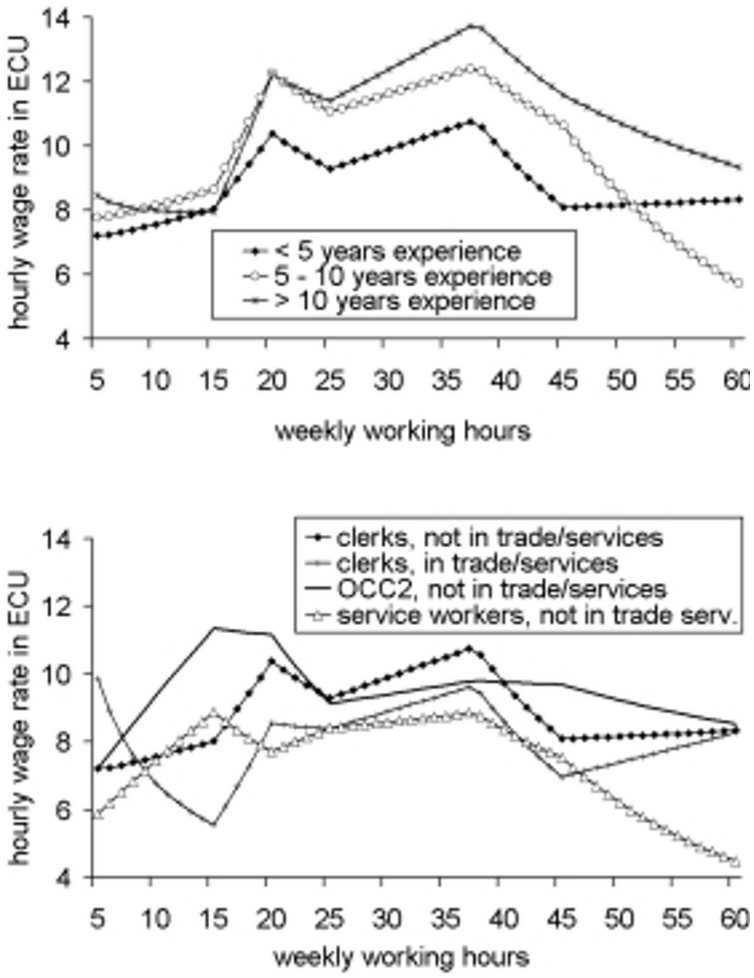
preparation time, their hourly wage rate is biased upward. Apart from that, teaching is known to be easily shared among more educators and unproblematic to interrupt for a child break. Therefore, I do not expect to detect negative wage differentials between part-time and full-time teachers.

In order to check to which extent the shape of the wage-hours profile of OCC2 is triggered by the peculiarity of teachers' and educators' working hours, I reestimate Model 4 and exclude the observations of these occupations. The estimation results are presented in Table 3 and the corresponding wage curves are illustrated in Figure 5. Indeed, the outstanding peak of the OCC2 spline-function vanishes. The shape of the other wage-hours curves (by experience level and sector) are not affected by the exclusion of the teachers. However, the figure still indicates that there seems to exist a positive wage premium for part-time professionals, health/teaching associate professionals and educators in Germany. This result is rather surprising and can hardly be explained by compensating wage differentials. Also the argument of decreasing productivity due to a fatigue effect seems not to be convincing, because the decline starts very early.[25] Hence, the open question that has to be answered is, whether there is anything special about these women that we cannot observe. One probably bold hypothesis is that these women represent important human capital or other specific abilities to the firm, which increases their bargaining power. In this setting, the employer is more likely to grant a request for reduced working hours by a highly regarded colleague, if there exists the risk that she is leaving otherwise. Unfortunately, these data do not allow any empirical evidence for this hypothesis.

Summing up, I conclude that although there exist significant differences among some occupations, the results do not support the hypothesis that occupations which are hardly done in part-time suffer higher wage cuts (see H3). Firstly, the wage curve of OCC1 does not differ from the clerks and secondly, women belonging to OCC2 seem to earn higher wage rates than full-time employees. However, the Dutch data provide some evidence that employers in the trade and service sector are less likely to enforce lower wages to part-time employees. In contrast, part-time employees in the Dutch trade or service sector seem to earn higher wages than their colleagues working full-time.

[25] It is interesting to note that Blank (1990) provides evidence that American female part-time workers in professional and managerial positions show particularly large and positive wage differentials, holding all other variables constant.

Figure 5: Wage-hours profiles of German women excluding teachers



Note: see Figures 3 and 4.

7 Summary and conclusions

Since the beginning of the 1970s, part-time work has increased substantially in most OECD countries (OECD, 1998). Since the time when unemployment became a serious problem in many European countries, part-time employment is often regarded as a means to share labor among more workers and therefore to increase employment. Apart from the uniform development of rising part-time work of women, especially mothers, the Netherlands is the only *part-time*

economy in the world (Freeman, 1998). Compared to Germany, the female part-time share is almost twice as high in the Netherlands and the opposite is true with respect to the unemployment rate. Since the wage rate is regarded as one of the main determinants of labor supply, it is straightforward to raise the question whether there exists a (higher) financial burden of working part-time in Germany compared to the Netherlands. If there actually exist wage differentials among part-time and full-time employees, recent policies aimed to encourage part-time employment in Germany are supposed to be ineffective.

Both economic theory and the institutional framework of the labor markets in Germany and the Netherlands provide various explanations why and how the gross hourly wage rates relate to the number of weekly working hours. However, the shape of the wage-hours profile is not clearly determined by these arguments. Empirical studies for different countries do not provide clear evidence about the wage gap either. Apart from this, most studies focus on a single country and are hardly useful for international comparison, because they use different empirical approaches or samples of different groups of individuals. Therefore, the aim of this paper is to analyze the relation between wage rates and working hours in a Dutch-German comparative perspective. Based on two comparable household surveys for Germany and the Netherlands, I estimate a simultaneous wage-hours model that fully takes into account the labor supply decision. Furthermore, I relax the assumptions that the wage-hours profile is dome-shaped and that the effect of working hours on wages is the same for all individuals.

Comparing gross hourly wage rates suppose that there exist significant wage reductions for German women who either work very short or very long hours. It is interesting to note that women working longer part-time hours do not seem to suffer severe wage cuts. In contrast, wage differentials between full-time and part-time women seem to be of minor importance in the Netherlands. By applying the simultaneous wage-hours model, I check whether the observed wage differences between part-time and full-time women change once individual and job-specific characteristics are accommodated.

The main findings can be briefly summarized by the following points:

- The estimated wage-hours profiles differ significantly across specific groups of individuals.
- The shape of the wage-hours curves cannot be captured appropriately by a quadratic specification. For Germany, there exists some evidence that the wage distribution is bimodal.

- Fully taking into account the labor supply decision turned out to be necessary for obtaining unbiased estimates for Germany. In the Netherlands, a simple OLS-regression would have been also appropriate in this case.

- As expected, the part-time wage gap is more pronounced in Germany than in the Netherlands (compare H1 and H2). Note however, that the estimated wage differentials should be interpreted as lower bounds, because of the common response behaviour to overrate low income (see Section 4 and the potential wage effects of hours restrictions expounded in footnote 6).

- Although there exist significant differences among some occupations, the results do not support the hypothesis that occupations which are hardly done in part-time suffer higher wage cuts (compare H3). Quite the reverse, German health or teaching associate professionals in part-time employment seem to earn higher wage rates than comparable full-time employees.

- In Germany, more experienced female employees face higher wage cuts for reduced working hours than women who spent few years in employment (compare H4). However, the Dutch data do not support this finding.

- Female employees in the Dutch trade or services sector seem to earn wage premiums for working less than 25 hours. The wage rate of their German colleagues exhibit a small peak at 15 hours (compare H5).

In my view, the most central result of this analysis is that the relation between working hours and wages is very complex and crucially depends upon individual and job-specific characteristics. Hence, it may be very illuminating to investigate the underlying mechanisms based on bigger data sets which allow a more detailed analysis of certain sub-samples, for example health or teaching associate professionals.

And what can be said about the resulting incentives on working hours? Assuming that the gross hourly wage rate is a decisive determinant of labor supply, the higher part-time share in the Netherlands does not really surprise. In practice however, there exist a couple of other factors which also matter, for example the tax or social security system or family arrangements.[26] Therefore, I do not claim that the difference in the part-time wage gap between Germany and the Netherlands fully explains the difference in the part-time shares, but they may partly be attributed to the wage structures.

[26]See for example den Dulk et al. (1999), Vermeulen et al. (1995), and Hansen (1997) for a detailed analysis of incentives on labor supply set by the German and Dutch welfare systems.

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Appendix

A Evaluation of the Likelihood Function

In my framework, the multivariate econometric problem involves both continuous (wages and hours) and discrete variables (participation). Therefore, the likelihood function is compounded by two parts. One part contains the probability densities with respect to the limited dependent variable, the other includes integrated probability functions with respect to the continuous variables. This composition is based on Bayes' theorem. Under normality assumptions, a joint density function can be decomposed in a partial density function and a conditional density function.

$$\varphi(Y^1, Y^2, \mu^1, \mu^2, \Sigma) \;=\; \underbrace{\varphi(Y^2; \mu^2, \Sigma^{22})}_{\text{p.d.f.}} \cdot \underbrace{\psi(Y^1; \mu^*, \Sigma^*)}_{\text{c.d.f}};$$

where Y^1 and Y^2 are the discrete and continuous variables of interest and μ^1 and μ^2 are their expected values. The correlation matrix Σ is composed of $\Sigma^{11} = cov(Y^1)$, $\Sigma^{22} = cov(Y^2)$ and $\Sigma^{12} = cov(Y^1, Y^2)$. Then, the distribution of Y^1 conditional on Y^2 can be written as $Y^1 \mid Y^2 \sim N(\mu^*, \Sigma^*)$, where $\mu^* = \mu^1 + \Sigma^{12}(\Sigma^{22})^{-1}(Y^2 - \mu^2)$ and $\Sigma^* = \Sigma^{11} - \Sigma^{12}(\Sigma^{22})^{-1}\Sigma^{21}$.

The likelihood function of this model can be divided into the likelihood contribution of the non-participants and the part of the active workers.

$$L = \mathrm{P}(P^* < 0) + f(\ln w, h) \cdot \mathrm{P}(P^* > 0 \mid \ln w, h)$$

The first part describes the probability of not working in the labor market and the second term describes the joint distribution of the observed wage rates and the corresponding working hours of employees. The likelihood contribution of these individuals is presented as a partially integrated normal density. In terms of the above specified model (see equation 1 to 3) the likelihood function can be rewritten as:

$$
\begin{aligned}
L &= (h=0)\cdot \mathrm{P}(v < -\gamma\cdot Z) + \\
&\quad (h>0)\cdot f(\ln w, h)\cdot \mathrm{P}(v > -\gamma\cdot Z \mid \ln w, h) \\
&= (h=0)\cdot \Phi(-\gamma\cdot Z) + (h>0)\cdot \varphi(\ln w, \ln h; \mu, \Sigma)\cdot \Phi\left(\frac{\mu^*}{\Sigma^*}\right), \\
&\quad \text{where } \mu^* \text{ and } \Sigma^* \text{ are defined above.}
\end{aligned}
$$

B Expected values of hourly wage rates in the simultaneous model

The wage-hours profiles of Model 3 and 4 presented in the text are based on the expected values of hourly wage rates, given the number of working hours. This implies that the correlation between working hours and wages is taken into account, provided it is significant. Since the simultaneous model is defined in log monthly earnings, the calculation of the expected hourly wage rates needs some transformations.

Let $E[\ln(wh) \mid h, X, Y, P^* > 0]$ be the expected value of log monthly earnings conditional on all exogenous variables in the simultaneous model. Since h is only observed if $P^* > 0$, this expression simplifies to $E[\ln(wh) \mid h, X, Y]$, which is equivalent to $E[\ln w \mid h, X, Y] + E[\ln h \mid h, X, Y]$. The expected value of log hourly wage rate can therefore be expressed as:

$$
\begin{aligned}
E[\ln w \mid h, X, Y] &= E[\ln(wh) \mid h, X, Y] - \ln h \\
&= X'\cdot\overline{\alpha} + f(h) + E(e \mid u) - \ln(h) \\
&= X'\cdot\overline{\alpha} + f(h) + \frac{\sigma_{eu}}{\sigma_u^2}u - \ln(h).
\end{aligned}
$$

The expected value of hourly wages differ in that a term depending on the variance of the wage equation enters the formula:

$$
\begin{aligned}
E[w \mid h, X, Y] &= \frac{1}{h}\cdot\exp\left(X'\cdot\overline{\alpha} + f(h) + \frac{\sigma_{eu}}{\sigma_u^2}u + \frac{1}{2}\cdot Var(e \mid u)\right) \\
&= \frac{1}{h}\cdot\exp\left(X'\cdot\overline{\alpha} + f(h) + \frac{\sigma_{eu}}{\sigma_u^2}u + \frac{1}{2}\cdot\sigma_e^2(1-\rho_{eu}^2)\right).
\end{aligned}
$$

C Further empirical results

Figure 6: Distribution of actual and desired working hours for German women

Note: Kernal estimates (width = 1.5 hours) of actual and desired working hours.
Source: Sub-sample of the GSOEP, 1995.

Table 4: Descriptive statistics of the Dutch and German samples

	Netherlands		Germany	
continuous variables	mean	std. dev.	mean	std. dev.
hourly wage rate (in ECU)	9.9	0.3	3.0	0.4
working hours	28.6	10.8	31.5	10.8
years of experience	13.4	8.8	13.6	9.2
potential years of experience	22.2	12.4	21.4	11.7
age	39.9	11.0	38.7	11.2
other household income (in nc[a])	3.8	3.4	3.3	2.2
income of the spouse (in nc[a])	2.0	1.7	2.1	2.3
age of youngest child	3.0	4.9	3.0	4.6
regional unemployment rate	11.78	1.6	9.3	1.8
discrete variables	freq.	percent	freq.	percent
employed	846	48.8	1257	52.2
unskilled	256	14.8	583	24.2
skilled (type I)	745	42.9	1082	44.9
skilled (type II)	460	26.5	544	22.6
commercial/techn. college	227	13.1	-	-
university	47	2.7	201	8.3
manager	33	3.9	25	2.0
professional	39	4.6	91	7.2
health/teching ass. professional	205	24.2	110	8.8
technician	98	11.6	158	12.6
clerks	199	23.5	469	37.3
service worker	238	28.1	301	24.0
production worker	34	4.0	103	8.2
firm size I[b]	138	16.2	103	8.2
firm size II	135	16.0	222	17.7
firm size III	113	13.4	345	27.5
firm size IV	460	54.4	269	21.4
child up to age 16 in the household	708	40.8	1080	44.8
married	1240	71.5	1633	67.8
employed spouse	1146	66.1	1429	59.3

Note: [a] nc: national currency (in 1000); [b] in the Netherlands, the four firm size categories include firms with < 10, 11-20, 21-200 and > 200 employees. The corresponding categories for Germany are: < 20, 21-200, 201-2000 and > 2000 employees.
Source: German Socio Economic Panel, 1995 and OSA-data, 1994.

Table 5: Hours and participation equations in Germany (Model 3)

hours equation			participation equation		
	coeff.	t-value		coeff.	t-value
constant	41.494	26.62	constant	-1.196	-2.44
# kids $\leq$ 3 year	-6.227	-2.23	kids	-1.314	-9.14
# kids 4-6 year	-8.010	-3.64	AGEKID	0.094	8.60
# kids 7-16 years	-5.664	-2.68	KIND16	-0.220	-1.20
unskilled	0.893	1.20	unskilled	-0.340	-4.66
skilled (type II)	1.033	1.45	skilled (type II)	-0.002	-0.03
(post-)graduate	1.206	1.12	(post-)graduate	0.123	0.99
pot. experience	-0.215	-1.65	age	0.168	6.67
pot. exp.^{2}/100	0.141	0.51	age^2/100	-0.230	-7.51
manager	9.228	5.29	married	-0.189	-2.36
professional	0.638	0.58	OINC	-0.279	-8.46
associate prof.	-0.637	-0.64	OINC^2/1000	0.167	5.30
technician	0.789	0.85	PART_SP	-0.129	-1.11
service worker	-2.911	-4.40	SPINC	0.209	4.53
product. worker	3.979	3.76	SPINC^2/100	-1.762	-3.94
married	-1.827	-2.52	taste for work	0.012	3.46
SPINC	-0.696	-2.34	KIDS16 $\cdot$ exp.	-0.004	-0.80
SPINC^2/100	0.032	0.01	KIDS16 $\cdot$ SCHOOL	0.013	1.23
OINC * KIDS16	-0.311	-1.92	regio. unempl. rate	-0.046	-3.03
taste for work	0.063	2.09	CARE	-0.101	-1.42
KIDS16 $\cdot$ exp.	0.037	0.73			
KIDS16 $\cdot$ SCHOOL	0.149	1.09			

Note: SPINC: income of the spouse (in 1000 DM); OINC: other net household income (e.g. income from rents, returns on capital) excluding spouse's income (in 1000 DM); KIND16: child up to age 16 living in the household; KIDS16: number of children up to age 16; SCHOOL; years of education; AGEKID: age of the youngest kid in the household; PART_SP: participation of the spouse; CARE: lone mothers with children up to 3 years, or existence of people in need of care in the household. The variable "taste for work" is created by a factor analysis from the question "How important are the following aims in your life". Among the topics which are evaluated by the individuals are (1) self-fulfillment, (2) success on the job, (3) having children, (4) being happily married, (5) to be able to afford something. These items are used to create a factor named taste for work. The interaction terms (KIDS16 $\cdot$ experience) and (KIDS16 $\cdot$ SCHOOL) are included in order to achieve more flexibility in the two reduced-form equations, so that they are at least a good approximation of any structural labor supply model.
Source: author's own calculation based on the GSOEP 1995.

Table 6: Hours and participation equations in Netherlands (Model 3)

hours equation			participation equation		
	coeff.	t-value		coeff.	t-value
constant	41.230	33.27	constant	0.207	0.35
# kids $\leq$ 3 year	-11.491	-4.34	kids	-0.829	-3.77
# kids 4-6 year	-9.971	-3.64	AGEKID	0.058	3.79
# kids 7-16 years	-10.188	-3.35	KIND16	-0.937	-3.60
unskilled	1.744	1.48	unskilled	-0.220	-2.10
skilled (type II)	0.029	0.04	skilled (type II)	0.422	4.85
techn. college	1.073	1.02	techn. college	0.825	6.73
university	4.086	2.42	university	0.896	3.84
pot. exp.	-0.261	-2.45	age	0.083	2.86
pot. exp.^{2}/100	-0.008	-0.03	age^2/100	-0.163	-4.50
manager	5.186	3.32	married	-0.225	-2.10
professional	0.224	0.14	OINC	0.167	0.72
associate prof.	-3.222	-3.59	OINC^2/1000	-0.093	-0.89
technician	0.736	0.72	PART_SP	-0.014	-0.08
service worker	-6.305	-7.87	SPINC	0.152	1.73
product. worker	0.321	0.21	SPINC^2/100	-2.525	-2.27
married	-3.120	-3.94	KIDS16 $\cdot$ exp.	0.013	1.89
SPINC	-0.946	-2.28	KIDS16 $\cdot$ SCHOOL	0.038	3.12
SPINC^2/100	4.361	0.59	regio. unempl. rate	-0.049	-2.38
OINC * KIDS16	0.298	0.42			
KIDS16 $\cdot$ exp.	0.210	2.60			
KIDS16 $\cdot$ SCHOOL	0.239	1.97			

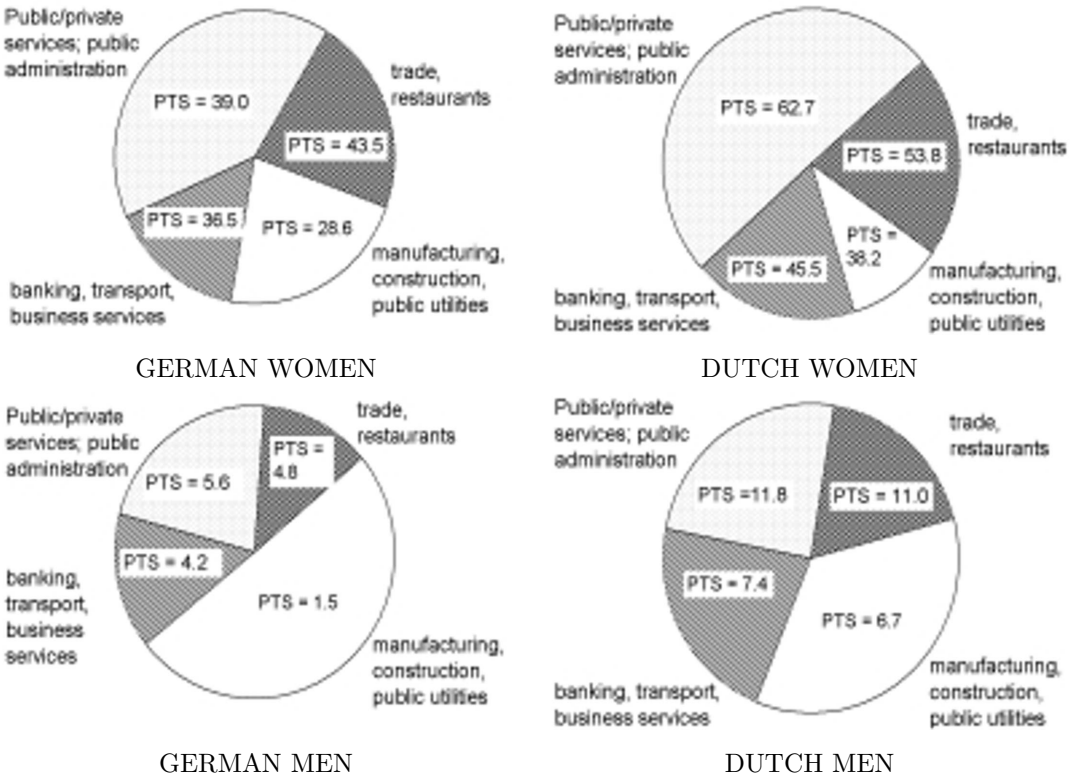
Note: see Table 5; SPINC: income of the spouse (in 1000 guilders); OINC: other net household income (e.g. income from rents, returns on capital)excluding spouse's income (in 1000 guilders).
Source: author's own calculation based on the OSA-data 1994.

Table 7: Part-time shares by occupation in Germany and the Netherlands

	Germany		Netherlands	
	$<$ 30 h.	$<$ 35 h.	$<$ 30 h.	$<$ 35 h.
legislator, senior officials, manager	0.0	4.0	21.2	39.4
professional (except teaching prof.)	35.2	39.6	43.6	56.4
health/teching (associate) prof.	38.2	46.4	53.7	70.7
technician, other associate prof.	27.9	31.7	32.7	40.8
clerks	35.0	41.6	43.2	51.3
service and sales worker	51.2	58.1	67.2	76.9
production worker	20.4	25.2	17.7	38.2

Note: the part-time share is defined as the percentage of employees with a certain occupation who work less than 30 respective 35 hours per week.
Source: author's own calculation based on the GSOEP and the OSA-data.

Figure 7: Economic structure and part-time shares (PTS) of male and female employees in Germany and the Netherlands (1994)



Note: the wedges represent the sectoral structure of female employees and the numbers denote the sector-specific part-time shares.
Source: Statistic Netherlands (1997), Statistisches Bundesamt (1995).